U.S. ARMY MATERIEL DEVELOPMENT AND READINESS COMMAND

MANUFACTURING METHODS & TECHNOLOGY

CAM RELATED PROJECTS

FY 83-85

PREPARED BY

USA INDUSTRIAL BASE ENGINEERING ACTIVITY

MANUFACTURING TECHNOLOGY DIVISION

ROCK ISLAND, ILLINOIS 61299

OCTOBER 1983

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This report provides a summary of the Army's FY 83-85 Manufacturing Methods and Technology Program directed toward computer-aided manufacturing. The following information is provided for 66 projects. Project number, title, projected funding, a statement of the problem and proposed solution, and thetechnology thrust area into which the project is categorized.

DEPARTMENT OF THE ARMY
US ARMY INDUSTRIAL BASE ENGINEERING ACTIVITY
ROCK ISLAND, ILLINOIS 61299

REPLY TO
ATTENTION OF:

DRXIB

30 September 1983

SUBJECT: CAM Related Projects

SEE DISTRIBUTION

1. Enclosed for your information is a listing of CAM Related (MMT) Projects. This publication provides a comprehensive overview of where the US Army Materiel Development and Readiness Command plans to invest MMT funds on CAM technology. Lists and summaries of the individual CAM related projects submitted by various DARCOM organizations are provided.

2. Questions regarding the contents of this report should be directed to Mr. Thethel N. Locke, Jr., US Army Industrial Base Engineering Activity, Rock Island Arsenal, IL 61299, AUTOVON 793-3682/6167, Commercial (309) 794-3682/6167.

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BY SUBORDINATE MAJOR SUBCOMMANDS

INTRODUCTION

This report contains a listing of the active FY83 and planned FY84-85 CAM related MMT projects. Data presented on each project includes the project number, title, projected funding, a statement of the problem and proposed solution, and the CAD/CAM technology thrust area into which the project is coded. Project information is presented in three sections, one for each fiscal year. Within each section, projects are grouped according to technology thrust areas. Descriptions of these thrust areas are found on pages 4 through 6.

An analysis, summary, and a composite listing by thrust area of projects for all three years is provided.

In addition, summaries of the industrial productivity improvement program and robotics projects are addressed separately in the appendix.

CAM TECHNOLOGY THRUST AREAS

To aid in analyzing MMT projects, each CAM related project is categorized into one of the following technology thrust areas. These thrust areas were originally identified in the Air Force's ICAM Program and were refined by the MTAG CAD/CAM Subcommittee.

Underlying the optimum benefits obtainable from utilizing CAM technology is the systems approach. Interrelationships between the various subsystems within an organization must be taken into consideration. These technology areas represent the "system" and direct thinking toward an integrated approach.

100 ARCHITECTURE

The purpose of the manufacturing architecture is to provide a clear understanding of the manufacturing environment and the interrelationships between subsystems that exist today. The manufacturing architecture, or framework, provides a common baseline in building integrated manufacturing systems.

200 FABRICATION

The fabrication technology area serves as a focus for all other technology area activities. Projects categorized into this area are directed toward increasing the productivity of manufacturing by systematically applying computer technology to all functions which directly and indirectly participate in fabricating parts.

300 DATA BASE/DATA AUTOMATION

The thrust area of data base and data automation is for technology required to support integration of the many stages and disciplines of manufacturing.

400 CAD/CAM INTERACTION

The purpose of this technology thrust area is to establish subsystems and procedures which will integrate the efforts of product design and manufacturing. The underlying concept is that of a common data base between engineering and manufacturing and the application of computer graphics.

500 PLANNING AND GROUP TECHNOLOGY

This thrust area is for technology directed at optimizing process planning, production scheduling and control, factory layout and other tasks normally performed by indirect personnel that have a significant impact on manufacturing cost.

600 MANUFACTURING CONTROL

Manufacturing control is a thrust area providing generic technology for producing management oriented information tools for scheduling, monitoring and controlling operations within the manufacturing environment. This thrust is closely related to the fabrication and planning and group technology areas.

700 ASSEMBLY

The assembly thrust area provides the integration of computer aided technology into assembly operations.

800 SIMULATION, MODELING AND OPERATIONS RESEARCH

This thrust area is soft technology for optimizing manufacturing systems through the application of operations research techniques.

900 MATERIALS HANDLING AND STORAGE

The integration of computer aided technology to aid in material handling is the primary goal of this thrust area. Objectives here include complying with OSHA and EPA standards and reducing costs and materials handling time through automated material storage, handling, and retrieval systems.

1000 TEST, INSPECTION AND EVALUATION

This thrust area emphasizes the development and transitioning of real time, computerized, nondestructive testing techniques for use in fabrication and assembly operations. Emphasis is put on automatic, in-process inspection and decision making without human intervention.

1100 CONTINUOUS FLOW PROCESSES

This technology area addresses the range of manufacturing processes that, for the most part, are continuous with minimum human interaction.

ANALYSIS

Sixty-six CAM related Manufacturing Methods and Technology (MMT) projects are summarized in this publication. The proposed funding and relative percent of the yearly MMT programs are:

CAM Related Projects	Percent of Program
FY 83 $ 7.6 Million	19.8
FY 84 $12.2 Million	13.9
FY 85 $20.6 Million	22.7

The projects are coded into one of eleven technology thrust areas. The thrust areas where planning is concentrated are:

	($ Millions)			
Technology Thrust Area	FY 83	FY 84	FY 85	Total
(100) Architecture	1.1	5.0	6.4	12.5
(200) Fabrication	2.2	1.7	7.5	11.4
(1000) Test, Eval, Inspection	0.0	0.4	5.5	5.9
(400) CAD/CAM Interaction	1.5	1.8	0.5	3.8

Charts depicting a five year funding profile (FY81-85) for each of the 11 thrust areas are provided on the following page.

The DARCOM Subordinate Major Commands that have proposed the largest CAM programs for the three years combined are:

	$ Million
AMCCOM (AMMO)	12.3
AMCCOM (WPNS)	11.1
MICOM	7.6
CECOM	3.7
TACOM	3.2

SUMMARY

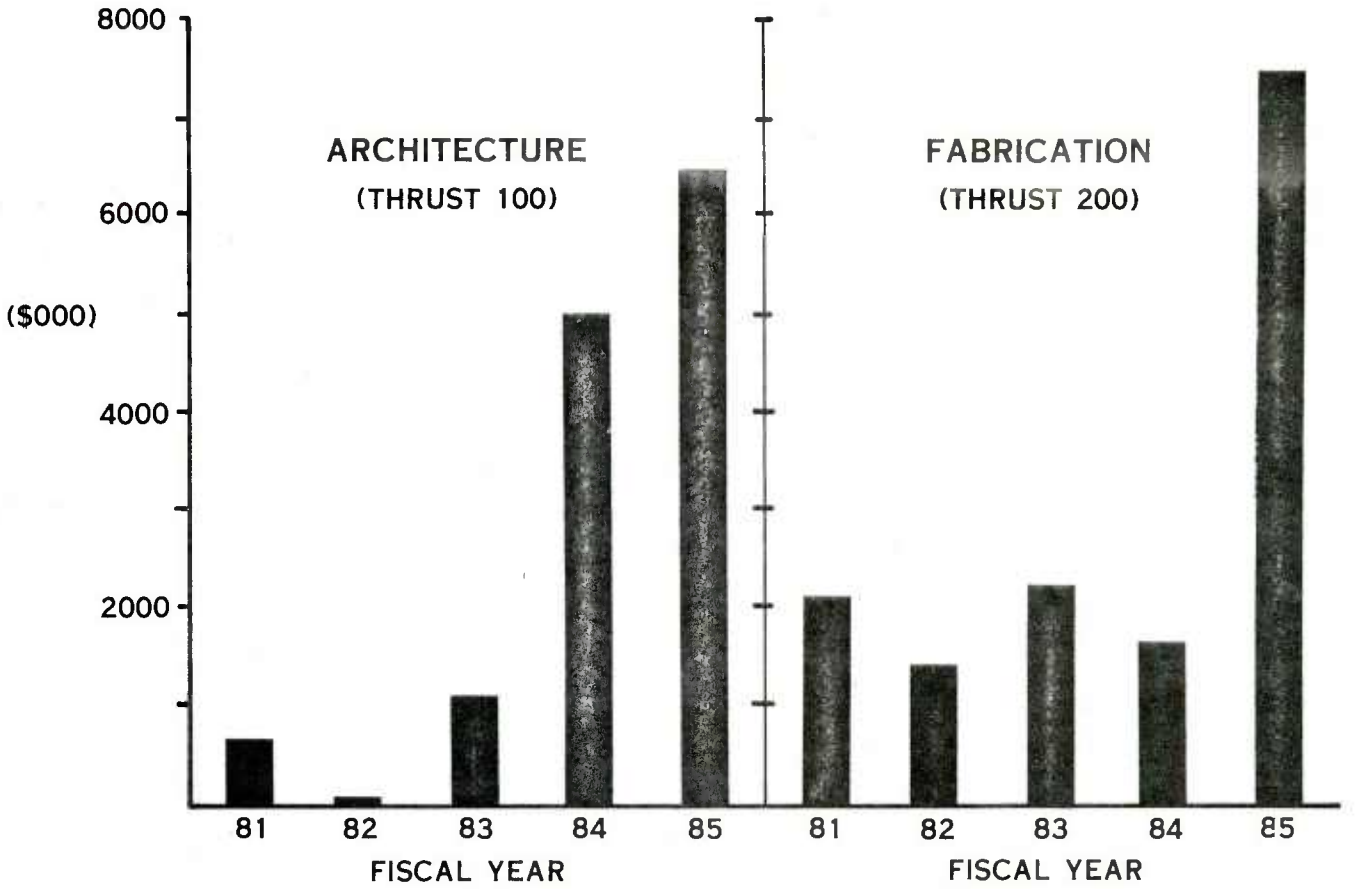
The tables and charts provided on the following pages provide information relative to the distribution of funds across the CAM technology thrust areas. The first table provides a composite of planned funding. This information is then presented on bar charts. The following tables identify the projected funding for each individual MMT project and the thrust area associated with the project.

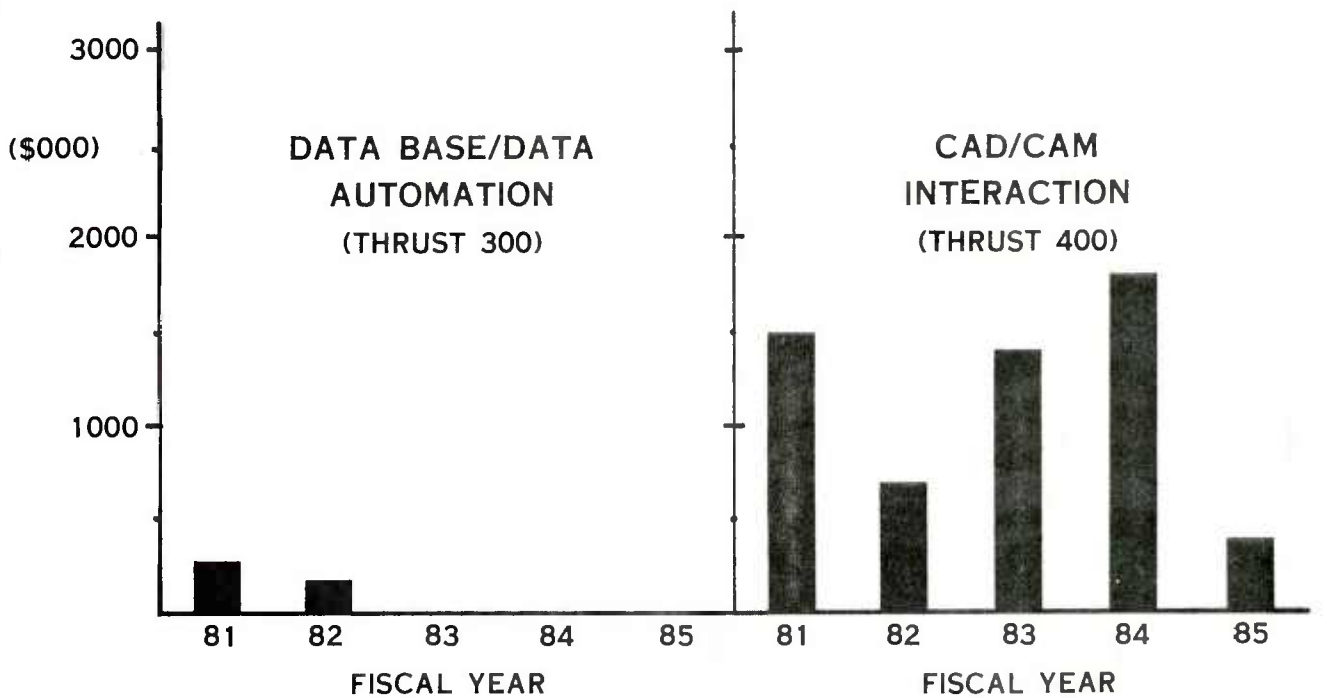
TECHNOLOGY THRUST AREAS
SUMMARY

FISCAL YEAR	THRUST AREA ($000)											
	100	200	300	400	500	600	700	800	900	1000	1100	Total
83	1129	2206	-	1512	750	1855	-	100	-	45	-	7597
84	5026	1665	-	1810	921	1362	1000	-	-	390	-	12174
85	6410	7489	-	505	200	500	-	-	-	5510	-	20614
Total	12565	11360	-	3827	1871	3717	1000	100	-	5945	-	40385

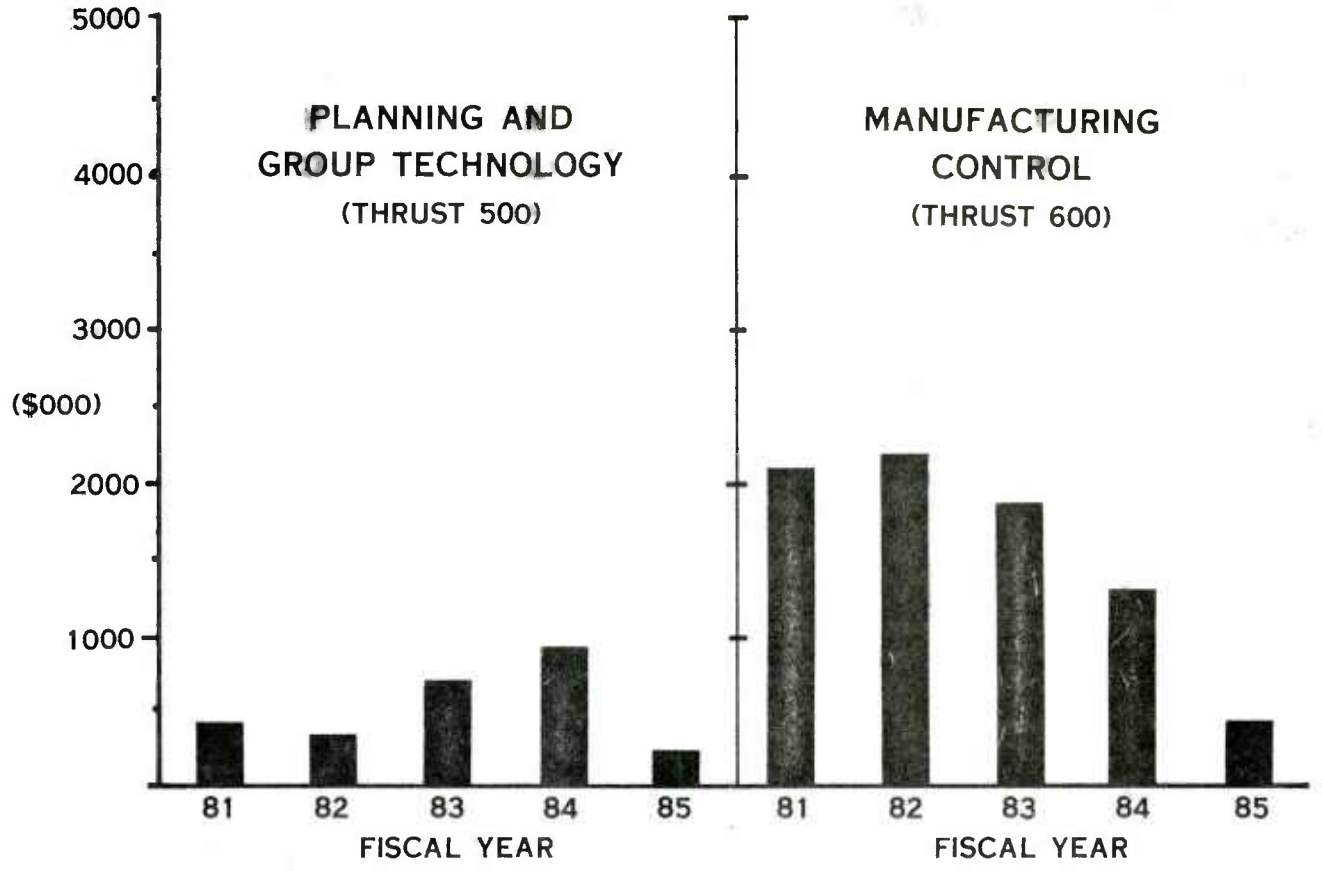
This matrix provides a summary of the dollar values of CAM related projects relative to the technology thrust areas listed. In addition, the bar charts on the next three pages depict the increase or decrease in the level of interest for each of the thrust areas over the five year period, FY81-85.

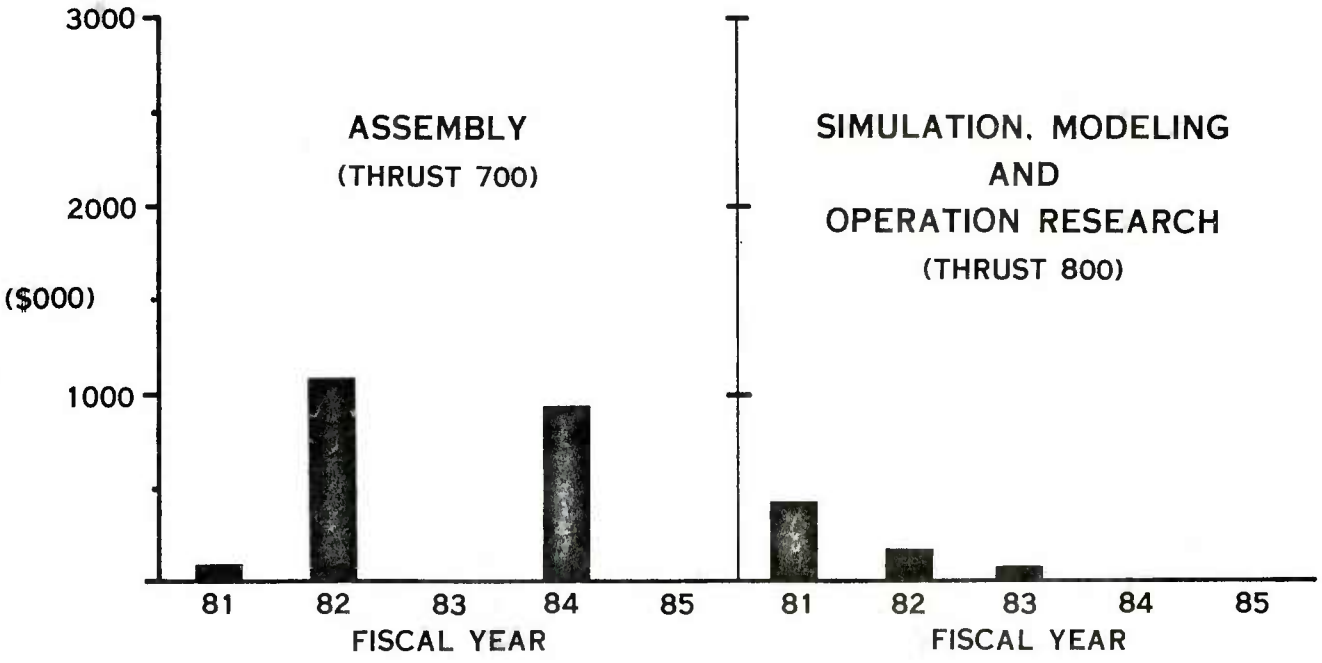
5-YEAR THRUST AREA SUMMARY



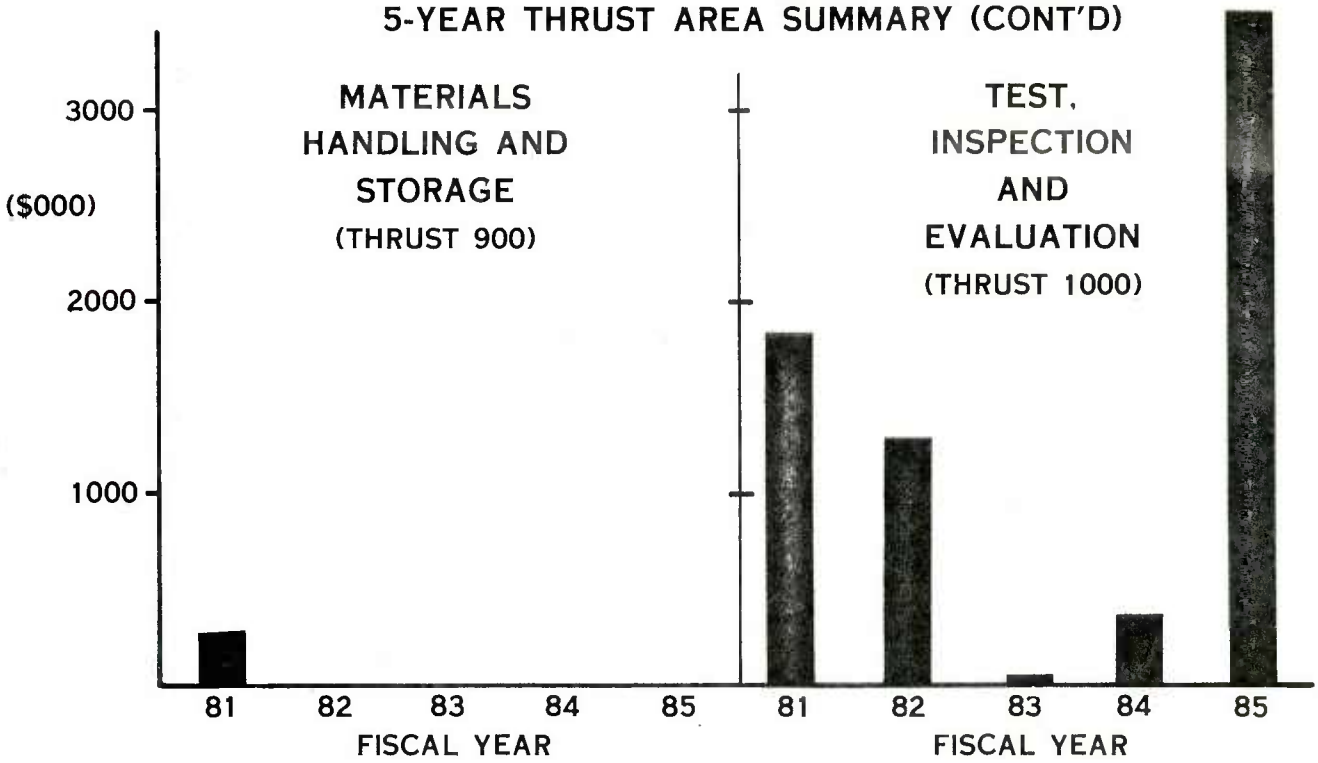


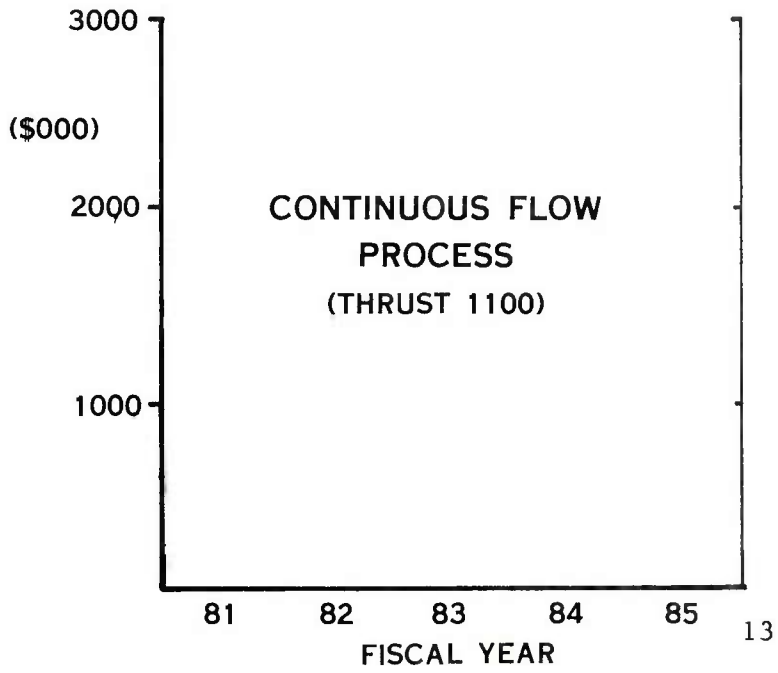
5-YEAR THRUST AREA SUMMARY (CONT'D)





5-YEAR THRUST AREA SUMMARY (CONT'D)





TECHNOLOGY THRUST AREAS

PROJECT LISTING

PROJECT NUMBER	PROJECT TITLE	THRUST	(FY)	PROJECT COST 83	84	85
2 3094	Communications Technology TechMod for JTIDS	Architecture		1054	1222	1000
3 1075	Electronics Computer Aided Manufacturing (ECAM)	Architecture			1100	3300
5 1501	Producibility - Integrated Computer Systems (PICS) (ARRCOM)	Architecture			150	
6 8305	Integrated Manufacturing System (IMS) (CAM)	Architecture		75	2094	950
6 8329	Fire Control Optical Devices New Process Production Tech	Architecture			460	
6 8559	CIM for Cannon CAD/CAM/COMM	Architecture				1160
3 1109	Robotized Wire Harness Assembly System	Assembly			1000	
3 1072	Multiple High Reliability/ Low Volume LSI Manufacturing (CAM)	CADCAM Interaction		1000	1200	
4 5005	Computer Aided Design for Cold Forged Gears (Phase II)	CADCAM Interaction		376		
6 8231	Improved Casting Technology (CAD/CAM)	CADCAM Interaction		136	122	
6 8402	Warm Forging for Weapon Components	CADCAM Interaction			227	227
6 8403	Design Criteria for Hardening (CAD/CAM)	CADCAM Interaction			261	278
G 3001	Power and Inertia Simulator- Combat Vehicle Testing	Sim, Model, Op Resch		100		

TECHNOLOGY THRUST AREAS

PROJECT LISTING (CONT'D)

PROJECT NUMBER	PROJECT TITLE	THRUST	(FY)	PROJECT COST 83	84	85
G 0002	CAM Application of Robotics to Shelter Refinishing	Fabrication		50	400	
H 3010	Hybrid Modulator for Pulsed Impatt Millimeter Wave Sources	Fabrication		363		
1 7443	Robotics for High Productivity Forgings	Fabrication			225	430
4 5082	Flex Machining Sys (FMS) Pilot Line F/TLV Comps (CAM) (PH V)	Fabrication		350		
4 5091	Heavy Aluminum Plate Fabrication (Phase I)	Fabrication		70		
4 6059-12	Automated Interior Spray Painting	Fabrication			350	
4 6095-01	Machining and Adaptive Control	Fabrication		300		
4 6121	CAD/CAM for the Bradley Fighting Vehicle	Fabrication		823		
5 4062	Auto Manufacture System for Mortar Increment Containers	Fabrication		250		
5 4624	Automated Mfg of Millimeter Wave Diodes (CAM)	Fabrication				2753
5 4628	Auto Mfg IR Detectors + Reflectors	Fabrication				2262
5 4630	Automated Method for Bore Sighting IR (CAM)	Fabrication				1581
6 8416	Flexible Machining System - RIA NCAM	Fabrication			399	178
6 8424	Automatic/Robotic Welding of Weapons Components	Fabrication			291	
6 8603	Robotic Welding - RIA	Fabrication				285

TECHNOLOGY THRUST AREAS
PROJECT LISTING (CONT'D)

PROJECT NUMBER	PROJECT TITLE	THRUST	(FY)	PROJECT COST 83	84	85
H 5174	CAM Sputtering Control for ZnO	Mfg. Control		150	422	
1 7471	Process Control System for N/C and CNC Machines	Mfg. Control				300
4 6057-15	Application of Group Technology to Ml Mfg Planning	Mfg. Control		300		
6 8120	Adaptive Control Technology (CAM)	Mfg. Control		495		200
6 8154	Computer Integrated Manufacturing (CIM) for Cannon	Mfg. Control		650	450	
6 8241	Computer Diagnostics + Control Appl to Bore Guidance (CAM)	Mfg. Control			85	
6 8243	Computer Control for Electrodeposition Systems	Mfg. Control		260		
6 8417	Factory Information Management - RIA (CAM)	Mfg. Control			280	
6 8433	In Process Control of Selas Heat Treat System (CAM)	Mfg. Control			125	
4 6057-15	Application of Group Technology to Ml Mfg Planning	Planning/Group Tech			350	
4 6059-09	Computer Simulation of Tracked Combat Vehicle Mfg Process	Planning/Group Tech		300		
5 0927	Computer Aided Process Planning for CB Filters (CAM)	Planning/Group Tech				200
6 7724	Group Technology of Weapon Systems (CAM)	Planning/Group Tech		250		
6 8306	On-Line Production Information System - RIA (CAM)	Planning/Group Tech		200	571	

TECHNOLOGY THRUST AREAS

PROJECT LISTING (CONT'D)

PROJECT NUMBER	PROJECT TITLE	THRUST	(FY)	PROJECT COST 83	84	85
G 7001	Automated Dynamometer Control for Standardized Inspection Testing (CAM)	Test, Insp, Eval		45		
2 9289	Autotest of Microwave Device Wafers (CAM)	Test, Insp, Eval			390	
5 4627	Auto Testing of Millimeter Wave Transducer	Test, Insp, Eval				2037
5 4629	Auto Assembly + Test of IR Transducer	Test, Insp, Eval				1946
5 4633	Auto Sensor Systems Test F/MMW + IR Sensor	Test, Insp, Eval				746
5 4659	Automatic Inspection for Rotating Band Chemistry	Test, Insp, Eval				432
6 8370	Auto Insp + Process Control of Wpns Parts Mfg (CAM)	Test, Insp, Eval				225
6 8510	Automated Inspection of Recoil Components	Test, Insp, Eval				140

FISCAL YEAR 83

CAM RELATED

MM&T

PROJECTS

ARMY CADCAM PROJECTS
83/10/04.

PROJ NUMBER	TITLE	PROJ COST
* F 83 3094	COMMUNICATIONS TECHNOLOGY TECHMOD FOR JTIDS	1054

PROBLEM	SOLUTION	TECHNOLOGY AREA
* COMMUNICATIONS EQUIPMENT IS MANUFACTURED USING LA BOR INTENSIVE, LOW VOLUME PROCESSES. MACHINES ARE OLD AND UNAUTOMATED. NEW METHODS, PROCESSES AND EQUIPMENT ARE NEEDED.	USE FLEXIBLE MANUFACTURING TECHNIQUES, COMPUTER AI DED MANUFACTURING, GROUP TECHNOLOGY, COMPUTER CONT ROLLED EQUIPMENT, ROBOTS, AND MOTORIZED CONVEYORS. USE AUTOMATIC INSERTION, VAPOR PHASE AND WAVE SOL DERING, AND NUMERICALLY CONTROLLED MACHINING.	ARCHITECTURE

PROJ NUMBER	TITLE	PROJ COST
* 6 83 8505	INTEGRATED MANUFACTURING SYSTEM (IMS) - (CAM)	75

PROBLEM	SOLUTION	TECHNOLOGY AREA
* MI SYSTEMS ARE APPLIED LOCALLY BUT THERE IS NO DA TA MANAGEMENT SYSTEM FOR THE ENTIRE MFG ACTIVITY. THIS INCREASES COST DUE TO LONG LEAD TIMES, SCHE DULE INTERRUPTIONS AND SHORTAGES OF MACHINE AVAIL ABILTY, LABOR AND MATERIAL.	DEVELOP AN MIS WHICH ADDRESSES ACTIVITIES OF ALL D IRECTORATES SUPPORTIVE TO MANUFACTURING AT RIA. TH E SYSTEM WILL USE STATE-OF-THE-ART TECHNOLOGY TO D ELINIATE OPTIMUM SCHEDULING AND PIN POINT POTENTIA L PROBLEM AREAS FOR EASIER RESOLUTION.	ARCHITECTURE

PROJ NUMBER	TITLE	PROJ COST
* 3 83 1072	MULTIPLE HIGH RELIABILITY/LOW VOLUME LSI MANUFACTURING (CAM)	1000

PROBLEM	SOLUTION	TECHNOLOGY AREA
* PRESENT PROCESSES FOR LSI CIRCUITS DO NOT ADEQUAT ELY SUPPORT MILITARY NEEDS. LSI MFG FACILITIES AR E STRUCTURED TO HANDLE HIGH VOLUME RUNS IN A SING LE PROCESS TECHNOLOGY.	UTILIZING THE CONCEPT OF GROUP TECHNOLOGY, A LINE OF MODULAR TYPE EQUIPMENT WILL AUTOMATE AND CONTRO L THE PROCESSES THROUGH A CENTRALIZED COMPUTER. TH IS SYSTEM WILL HANDLE MULTIPLE LSI TYPES INVOLVING MULTIPLE TECHNOLOGIES.	CADCAM INTERACTION

PROJ NUMBER	TITLE	PROJ COST
* 4 83 5005	COMPUTER AIDED DESIGN FOR COLD FORGED GEARS (PHASE II)	376

PROBLEM	SOLUTION	TECHNOLOGY AREA
* MACHINING AND OTHER PROCESSES ADD COST TO THE FINISHED COMPONENT.	ESTABLISH A MFG PROCESS TO RESULT IN A FINISHED GEAR TO DRAWING TOLERANCES FROM BAR STOCK AT AMBIENT TEMPERATURES.	CADCAM INTERACTION

PROJ NUMBER	TITLE	PROJ COST
* 6 83 8231	IMPROVED CASTING TECHNOLOGY (CAD/CAM)	136

PROBLEM	SOLUTION	TECHNOLOGY AREA
* EXCESSIVE METAL MUST BE MELTED IN CASTING OPERATIONS. THE YIELD RATIO OF SOME CASTS IS TOO LOW AND THE GATES AND RISERS TOO DIFFICULT TO CUT OFF. MATERIAL PROPERTIES OFTEN VARY WITH CASTING PROCEDURES.	USING COMPUTERIZED TECHNIQUES AND PRODUCTION CASTING FACILITIES, THE OPTIMUM SHAKE OUT TIMES, RISER SLEEVES AND GATING AND RISERING CONFIGURATIONS WOULD BE DETERMINED. PROPERTIES OF CAST MATERIALS WILL BE EVALUATED FOR DIFFERENT CAST DESIGNS.	CADCAM INTERACTION

PROJ NUMBER	TITLE	PROJ COST
* 6 83 0002	CAM APPLICATION OF ROBOTICS TO SHELTER REFINISHING	50

PROBLEM	SOLUTION	TECHNOLOGY AREA
* SPRAY PAINTING AND SANDING OF ALUM SKINNED MILITARY CONTAINERS IS LABOR INTENSIVE AND CREATES A HARSH WORKING ENVIRONMENT. DEVICES TO SENSE PRESENCE AND ABSENCE OF PAINT + TO CONTROL HEAT BUILD-UP TO PREVENT ALUM SKIN DELAMINATION ARE NEEDED.	DEVELOP A ROBOT EQUIPMENT SPECIFICATON AND DESIGN WITH NECESSARY FEEDBACK MECHANISMS.	FABRICATION CADCAM

PROJ NUMBER	TITLE	PROJ COST
H 83 3010	HYBRID MODULATOR FOR PULSED IMPATT MILLIMETER WAVE SOURCES	363

PROBLEM	SOLUTION	TECHNOLOGY AREA
TO ESTABLISH A MANUFACTURING CAPABILITY FOR PRODUCTION OF IMPATT DIODES WHICH ARE UNIFORM ENOUGH TO BE FIELD REPLACEABLE IN ARMY SYSTEMS.	ESTABLISH TECHNIQUES AND PROCESSES CAPABLE OF PRODUCING SILICON DOUBLE DRIFF IMPATT SOURCES. PRECISE AND RIGOROUS COMPUTER CONTROL OF ALL MATERIAL IS REQUIRED.	FABRICATION CADCAM

PROJ NUMBER	TITLE	PROJ COST
4 83 5082	FLEX MACHINING SYS (FMS) PILOT LINE F/TLV COMPS (CAM) (PH V)	350

PROBLEM	SOLUTION	TECHNOLOGY AREA
PARTS FOR TRACKED COMBAT VEHICLES ARE TYPICALLY NOT MANUFACTURED IN LARGE QUANTITIES. BECAUSE OF THIS, MASS PDN TECHNOLOGIES THAT RESULT IN LOWER PDN COSTS ARE NOT USED.	THE ADVANTAGES OF MASS PDN CAN BE REALIZED IN PRODUCING MEDIUM QUANTITY SIZE LOTS BY A CONCEPT KNOWN AS, FLEXIBLE MACHINING SYSTEMS. THIS PROJECT WILL ADVANCE THE FMS TECHNOLOGY MAKING IT FEASIBLE TO UTILIZE FMS FOR THE MFG OF ARMY MATERIEL.	FABRICATION CADCAM

PROJ NUMBER	TITLE	PROJ COST
4 83 5091	HEAVY ALUMINUM PLATE FABRICATION (PHASE I)	70

PROBLEM	SOLUTION	TECHNOLOGY AREA
MANY COMBAT AND TACTICAL VEHICLE HULLS AND THEIR COMPONENTS ARE FABRICATED FROM HEAVY ALUMINUM PLATE. CUTTING THIS HEAVY ALUMINUM PLATE TO SPECIFIED CONTOURS AND WELDING THE PIECES TOGETHER REQUIRES A GREAT DEAL OF MANUAL LABOR.	ESTABLISH THE CAPABILITY TO CUT HEAVY ALUMINUM PLATE RAPIDLY USING PLASMA ARC WITH NUMERICAL CONTROLS. PROCESS PARAMETERS WILL BE ESTABLISHED FOR HIGH DEPOSITION WELDING PROCESSES.	FABRICATION CADCAM

PROJ NUMBER	SUBTASK	TITLE	PROJ COST
* 4 83 6095	01	MACHINING AND ADAPTIVE CONTROL	300

PROBLEM	SOLUTION	TECHNOLOGY AREA
* A NUMBER OF TECHNOLOGICAL AREAS HAVE BEEN IDENTIFIED WHICH CAN BE APPLIED AS COST REDUCING MEASURES OR AS A MEANS OF IMPROVING THE MANUFACTURE COST OF THE M1 ABRAM TRANSMISSION.	THE TECHNOLOGICAL AREAS WILL BE SEPARATED INTO 4 TASKS. A FINAL REPORT WILL BE GENERATED FOR EACH TASK ALONG WITH PILOT HARDWARE AND/OR CHANGES TO THE TECHNICAL DATA PACKAGE AS APPROPRIATE TO ACCOMMODATE IMPLEMENTATION.	FABRICATION CADCAM

PROJ NUMBER	TITLE	PROJ COST
* 4 83 6121	CAD/CAM FOR THE BRADLEY FIGHTING VEHICLE	925

PROBLEM	SOLUTION	TECHNOLOGY AREA
* MANUFACTURING TECHNIQUES FOR THE BFV ARE IN NEED OF IMPROVEMENT IN THE AREA MATERIAL SELECTION, MANUFACTURING PRINCIPALS, AND QUALITY CONTROL. IN ADDITION CURRENT TECHNIQUES ARE EXTREMELY LABOR INTENSIVE.	IMPLEMENT THE FOLLOWING SUBTASKS TO IMPROVE THE BFV; ROBOTIC WELDING, ROBOTIC HARNESS ASSY, ADAPTIVE CONTROL + CUTTER SENSING, AUTOMATED PART GAUGING + INSPECTION, AND MANUFACTURING CELL WITH ROBOTIC LOADING.	FABRICATION CADCAM

PROJ NUMBER	TITLE	PROJ COST
* 5 83 4062	AUTO MANUFACTURE SYSTEM FOR MORTAR INCREMENT CONTAINERS	250

PROBLEM	SOLUTION	TECHNOLOGY AREA
* THE MANUFACTURE AND ASSEMBLY OF THE 60/81MM PROP CHARGE INCREMENT CONTAINER IS LABOR INTENSIVE AND DOES NOT MEET PRODUCTION REQUIREMENTS.	DEVELOP PROCESS AND EQUIPMENT TO REDUCE COSTS, INCREASE PRODUCTION RATES, AND IMPROVE QUALITY.	FABRICATION CADCAM

ARMY CADCAM PROJECTS
83/10/04.

PROJ NUMBER	TITLE	PROJ COST
* H 83 5174	CAM SPUTTERING CONTROL FOR ZNO	150

PROBLEM	SOLUTION	TECHNOLOGY AREA
* GAS MIXTURE, ZNO PURITY + SPUTTERING PARAMETERS ARE MANUALLY MONITORED USING A MASS ANALYZER. CORRECTIONS IN FLOW + DEPOSITION PROCESSES ARE SLOW AND PERFORMED AFTER OCCURRENCE.	LATEST STATE-OF-THE-ART MASS ANALYSIS EQUIPMENT WILL BE COMPUTER/ MICROPROCESSOR COUPLED TO THE PROCESSING EQUIPMENT USED FOR FABRICATING ZNO DELAY LINES. VACUUM DEPOSITION AND GAS FLOW RATES WILL BE OPTIMIZED.	MANUFACTURING CONTROL

PROJ NUMBER	SUBTASK	TITLE	PROJ COST
* H 83 6057	15	APPLICATION OF GROUP TECHNOLOGY TO M1 MFG PLANNING	300

PROBLEM	SOLUTION	TECHNOLOGY AREA
* MATERIALS AND MANUFACTURING PROCESSES EMPLOYED IN THE MFG OF THE M1 CAN BE IMPROVED BY INCORPORATING NEW TECHNOLOGIES TO THE CURRENT SYSTEM. THIS WILL ENABLE THE M1 TO BE PRODUCED MORE ECONOMICALLY.	IMPROVE PROCESSES FOR M1 MFG. THESE INCLUDE THERMAL CUTTING, AUTOMATED METALLIZING, THERMALLY ASSISTED MACHINING, ETC.	MANUFACTURING CONTROL

PROJ NUMBER	TITLE	PROJ COST
* O 83 8120	ADAPTIVE CONTROL TECHNOLOGY (CAM)	495

PROBLEM	SOLUTION	TECHNOLOGY AREA
* CURRENT GRINDING PROCESSES DO NOT TAKE ADVANTAGE OF THE GRINDING WHEEL CUTTING EFFICIENCY. PRECISION TOLERANCES ARE DIFFICULT TO HOLD DUE TO PART HEATING. WHEEL WEAR RATES INCREASE EXPONENTIALLY WITH FEED RATES AND LIMIT PRODUCTIVITY.	USE A PROCESS CALLED ENERGY ADAPTIVE GRINDING. IT USES AN ADAPTIVE CONTROL, FITTED TO A CYLINDRICAL GRINDER. WHEEL SPEED, WHICH DETERMINES WHEEL SHARPNESS WHICH EFFECTS METAL REMOVAL RATES AND EFFICIENCY, IS CONTROLLED.	MANUFACTURING CONTROL

PROJ NUMBER	TITLE	PROJ COST
* 6 83 8154	COMPUTER INTEGRATED MANUFACTURING (CIM) FOR CANNON	650

PROBLEM	SOLUTION	TECHNOLOGY AREA
* NUMERICAL CONTROL MACHINE TOOLS OFFER MANY ADVANTAGES OVER CONVENTIONAL MACHINE TOOLS BUT HAVE CERTAIN DISADVANTAGES. ONE PROBLEM AREA IS GETTING MACHINE INSTRUCTIONS TO THE MACHINE TOOL AND COLLECTING MANAGEMENT INFORMATION.	INTERFACE IN-HOUSE COMPUTER FACILITIES WITH CURRENT AND FUTURE NC MACHINE TOOLS TO FORM AN ADVANCED COMPUTER INTEGRATED MFG SYSTEM. UTILIZE DNC TECHNOLOGY.	MANUFACTURING CONTROL

PROJ NUMBER	TITLE	PROJ COST
* 6 83 8243	COMPUTER CONTROL FOR ELECTRODEPOSITION SYSTEMS	260

PROBLEM	SOLUTION	TECHNOLOGY AREA
* CHROMIUM PLATING OF CANNON BARRELS IS A COMPLICATED, MULTI-STAGE PROCESS WHICH IS MANUALLY CONTROLLED. MANUAL MANIPULATION OF VALVE STRESS, ETC., IS SLOW, SOMETIMES HAZARDOUS, AND CAN RESULT IN DEGRADED DEPOSIT QUALITY DUE TO HUMAN ERROR.	THE CRITICAL STAGES OF THE CHROMIUM PLATING PROCESS WILL BE IDENTIFIED AND A PROGRAMMABLE CONTROLLER (S) DEVELOPED TO REDUCE TO NEAR ZERO THE MANIPULATION FUNCTIONS REQUIRED OF AN OPERATOR.	MANUFACTURING CONTROL

PROJ NUMBER	SUBTASK	TITLE	PROJ COST
* 4 83 6059	09	COMPUTER SIMULATION OF TRACKED COMBAT VEHICLE MFG PROCESS	300

PROBLEM	SOLUTION	TECHNOLOGY AREA
* MATERIALS AND MANUFACTURING PROCESSES EMPLOYED IN THE MFG OF THE FVS CAN BE IMPROVED BY INCORPORATING NEW TECHNOLOGIES TO THE CURRENT SYSTEM. THIS WILL ENABLE THE FVS TO BE MANUFACTURED MORE ECONOMICALLY.	IMPROVE PROCESSES FOR FVS MFG. THESE INCLUDE CAST ALUM COMPONENTS, LASER HEAT TREAT, SELF THREADING FASTNERS, ADHESIVE BONDING, PLASMA ARC WELDING, ETC.	PLANNING/GROUP TECH

ARMY CADCAM PROJECTS
83/10/04.

PROJ NUMBER	TITLE	PROJ COST
* 6 83 7724	GROUP TECHNOLOGY OF WEAPON SYSTEMS (CAM)	250

PROBLEM	SOLUTION	TECHNOLOGY AREA
* A PROLIFERATION OF DESIGNS AND PARTS EXIST FOR THE PRODUCTION OF CANNON. UNIQUE MANUFACTURING ROUTINGS ARE GENERATED FOR EACH COMPONENT AND CUSTOM TOOLING AND FIXTURING IS REQUIRED.	THE ARMY HAS PURCHASED A GROUP CLASSIFICATION AND CODING SOFTWARE PACKAGE. ONCE THIS SYSTEM IS IMPLEMENTED, IT SHOULD BE POSSIBLE TO REDUCE THE NUMBER OF DIFFERENT PARTS THRU STANDARDIZATION.	PLANNING/GROUP TECH

PROJ NUMBER	TITLE	PROJ COST
* 6 83 8306	ON-LINE PRODUCTION INFORMATION SYSTEM - RIA (CAM)	200

PROBLEM	SOLUTION	TECHNOLOGY AREA
* THE MANUFACTURING DATA BASE CANNOT BE ACCESSED THROUGH AN ON-LINE DATA BASE SYSTEM, MAKING INTEGRATION OF AUTOMATED SYSTEMS FOR PROCESS PLANNING,TIME STDS GENERATION, FACILITIES/MOBILIZATION PLANNING AND PRODUCTION CONTROL SIMULATION DIFFICULT.	DEVELOP THE MANUFACTURING DATA BASE FROM ITS PRESENT BATCH ORIENTATED ENVIRONMENT TO AN ON-LINE SYSTEM.	PLANNING/GROUP TECH

PROJ NUMBER	TITLE	PROJ COST
* 6 83 3001	POWER AND INERTIA SIMULATOR-COMBAT VEHICLE TESTING	100

PROBLEM	SOLUTION	TECHNOLOGY AREA
* THE TEST TRACK AT THE MAINZ ARMY DEPOT IS A PRIMARY BOTTLENECK IN THE REBUILD MISSION. ALTHOUGH THE TEST TRACK IS OVERLOADED AN INCREASE IN THE WORKLOAD IS PROJECTED.	A POWER AND INERTIA SIMULATOR FOR TESTING COMBAT VEHICLES WILL BE DESIGNED AND FABRICATED.	SIM, MODEL, OP RESCH

ARMY CADCAM PROJECTS
83/10/04.

PROJ NUMBER	TITLE	PROJ COST
G 83 7001	AUTO DYNAMOMETER CONTROL F/STANDARDIZED INSPECT TEST (CAM)	45

PROBLEM	SOLUTION	TECHNOLOGY AREA
ALL ENGINES ARE TORN DOWN WHILE 20% COULD BE RESTORED TO OPERATION WITHOUT PHYSICAL TEARDOWN. TEARDOWN IS 1/3 COST OF OVERHAUL. ALL ENGINES REBUILT REQUIRE A 4 HOUR DYNAMOMETER OPERATIONAL TEST CYCLE.	AUTOMATE CURRENT MANUALLY OPERATED DYNAMOMETER TEST CELLS ALLOWING PRESHOP INSPECTION WITHOUT TEARDOWN AND REDUCING REBUILT ENGINE RUN-IN TIME BY EIGHTY PERCENT.	TEST, INSP, EVAL

FISCAL YEAR 84

CAM RELATED

MM&T

PROJECTS

ARMY CADCAM PROJECTS
83/10/04.

PROJ NUMBER	TITLE	PROJ COST
* 2 84 3094	COMUNICATIONS TECHNOLOGY TECHMOD FOR JTIDS (CAM)	1222

PROBLEM	SOLUTION	TECHNOLOGY AREA
* COMMUNICATIONS EQUIPMENT IS MANUFACTURED USING LA BOR INTENSIVE, LOW VOLUME PROCESSES. MACHINES ARE OLD AND UNAUTOMATED. NEW METHODS, PROCESSES AND EQUIPMENT ARE NEEDED.	USE FLEXIBLE MANUFACTURING TECHNIQUES, COMPUTER AI DED MANUFACTURING, GROUP TECHNOLOGY, COMPUTER CONT ROLLED EQUIPMENT, ROBOTS, AND MOTORIZED CONVEYORS. USE AUTOMATIC INSERTION, VAPOR PHASE AND WAVE SOL DERING, AND NUMERICALLY CONTROLLED MACHINING.	ARCHITECTURE

PROJ NUMBER	TITLE	PROJ COST
* 3 84 1075	ELECTRONICS COMPUTER AIDED MANUFACTURING (ECAM)	1100

PROBLEM	SOLUTION	TECHNOLOGY AREA
* ALTHOUGH INTEGRATED CIRCUITS, HYBRID CIRCUITS,PRI NTED CIRCUITS AND CABLES ARE DESIGNED ON A COMPUT ER, THERE IS LITTLE COMPUTERIZED CONTROL OF PROCE SSES USED TO PRODUCE THESE ITEMS. A MASTER PLAN I S NEEDED TO DEFINE THE AREA AND REQUIREMENTS.	DEVELOP A DOD MASTER PLAN FOR COMPUTER-AIDED DESIG N AND MFG OF ELECTRONIC SYSTEMS. USE AIR FORCE?S I CAM AND NASA?S IPAD PROGRAMS TO DEFINE CAD/CAM AND ELECTRONIC TECHNOLOGIES TO MAKE INTEGRATED CIRCUI TS,HYBRID CIRCUITS,PRINTED CIRCUITS, AND CABLES.	ARCHITECTURE

PROJ NUMBER	TITLE	PROJ COST
* 5 84 1501	PRODUCIBILITY - INTEGRATED COMPUTER SYSTEMS (PICS) (ARRCOM)	150

PROBLEM	SOLUTION	TECHNOLOGY AREA
* THE EXCHANGE OF ACCURATE MANUFACTURING AND PRODUC T DESIGN INFORMATION WITHIN THE ARMAMENT COMMUNIT Y IS DONE WITH HARDCOPY DRAWINGS AND REPORTS. POO R COMMUNICATIONS AND SLOW RESPONSIVENESS ARE DUE TO LACK OF ACCESS TO CURRENT GEOMETRIC AND OTHER*	ESTABLISH THE REQUIREMENTS FOR A COMPUTER SYSTEM N ETWORK BETWEEN HQ, ARRCOM AND THE ARMAMENT PRODUCT ION BASE.	ARCHITECTURE

PROJ NUMBER	TITLE	PROJ COST
* 6 84 8305	INTEGRATED MANUFACTURING SYSTEM (IMS) (CAM)	2094

PROBLEM	SOLUTION	TECHNOLOGY AREA
* MI SYSTEMS ARE APPLIED LOCALLY BUT THERE IS NO DATA MANAGEMENT SYSTEM FOR THE ENTIRE MFG ACTIVITY. THIS INCREASES COST DUE TO LONG LEAD TIMES, SCHEDULE INTERRUPTIONS AND SHORTAGES OF MACHINE AVAILABILTY, LABOR AND MATERIAL.	DEVELOP AN MIS WHICH ADDRESSES ACTIVITIES OF ALL DIRECTORATES SUPPORTIVE TO MANUFACTURING AT RIA. THE SYSTEM WILL USE STATE-OF-THE-ART TECHNOLOGY TO DELINIATE OPTIMUM SCHEDULING AND PIN POINT POTENTIAL PROBLEM AREAS FOR EASIER RESOLUTION.	ARCHITECTURE

PROJ NUMBER	TITLE	PROJ COST
* 6 84 8329	FIRE CONTROL OPTICAL DEVICES NEW PROCESS PRODUCTION TECH	460

PROBLEM	SOLUTION	TECHNOLOGY AREA
* PRODUCTION DELAYS AND COST OF REWORKS HAVE BEEN A GREAT LLGISTICS PROBLEM. THERE HAS BEEN A SIGNIFICANT SHORTFALL IN PRODUCTION CAPABILITY.	ASSESSMENT OF NEW PROCESS TECHNOLOGY, UPDATED EQUIPMENT AND OPTIMIZED PROCESSES IS NECESSARY FOR THE ASSEMBLY OF A PILOT PRODUCTION LINE CAPABLE OF DEMONSTRATING HIGH SPEED PRODUCTION AND IMPROVED INSPECTION TECHNIQUES.	ARCHITECTURE

PROJ NUMBER	TITLE	PROJ COST
* 3 84 1109	ROBOTIZED WIRE HARNESS ASSEMBLY SYSTEM	1000

PROBLEM	SOLUTION	TECHNOLOGY AREA
* MANUAL HARNESS PROCEDURES UTILIZE SEVERAL STATION + SIGNIFICANT REPEATED MATERIAL HANDLING + TRANSFER. APPROXIMATELY 50 PERCENT OF FABRICATION TIME IS DEVOTED TO HANDLING, SORTING, AND IDENTIFICATION.	AN INTEGRATED APPROACH TOWARDS WIRE HARNESS FABRICATION WILL USE A ROBOT ARM WITH 6 DEGREES OF FREEDOM TO INCORPORATE WIRE PREPARATION, HARNESS ASSY, AND TESTING INTO A SINGLE WORK STATION,	ASSEMBLY CADCAM

ARMY CADCAM PROJECTS
83/10/04.

PROJ NUMBER	TITLE	PROJ COST
* 5 84 1072	MULTIPLE HIGH RELIABILITY/LOW VOLUME LSI MANUFACTURING (CAM)	1200

PROBLEM	SOLUTION	TECHNOLOGY AREA
* PRESENT PROCESSES FOR LSI CIRCUITS DO NOT ADEQUATELY SUPPORT MILITARY NEEDS. LSI MFG FACILITIES ARE STRUCTURED TO HANDLE HIGH VOLUME RUNS IN A SINGLE PROCESS TECHNOLOGY.	UTILIZING THE CONCEPT OF GROUP TECHNOLOGY, A LINE OF MODULAR TYPE EQUIPMENT WILL AUTOMATE AND CONTROL THE PROCESSES THROUGH A CENTRALIZED COMPUTER. THIS SYSTEM WILL HANDLE MULTIPLE LSI TYPES INVOLVING MULTIPLE TECHNOLOGIES.	CADCAM INTERACTION

PROJ NUMBER	TITLE	PROJ COST
* 6 84 8231	IMPROVED CASTING TECHNOLOGY	122

PROBLEM	SOLUTION	TECHNOLOGY AREA
* EXCESSIVE METAL MUST BE MELTED IN CASTING OPERATIONS. THE YIELD RATIO OF SOME CASTS IS TOO LOW AND THE GATES AND RISERS TOO DIFFICULT TO CUT OFF. MATERIAL PROPERTIES OFTEN VARY WITH CASTING PROCEDURES.	USING COMPUTERIZED TECHNIQUES AND PRODUCTION CASTING FACILITIES, THE OPTIMUM SHAKE OUT TIMES, RISER SLEEVES AND GATING AND RISERING CONFIGURATIONS WOULD BE DETERMINED. PROPERTIES OF CAST MATERIALS WILL BE EVALUATED FOR DIFFERENT CAST DESIGNS.	CADCAM INTERACTION

PROJ NUMBER	TITLE	PROJ COST
* 6 84 8402	WARM FORGING FOR WEAPON COMPONENTS	227

PROBLEM	SOLUTION	TECHNOLOGY AREA
* EXCESSIVE ENERGY IS CONSUMED IN CONVENTIONAL FORGING. ALSO DIE LIFE IS SHORTENED BY HIGH FORGING TEMPERATURES AND BY OXIDATION.	BY USING CAD/CAM TECHNIQUES FOR DIE DESIGN, FORGING WILL BE DONE AT MUCH LOWER TEMPERATURE AND THE FINAL PARTS WILL HAVE BETTER MECHANICAL PROPERTIES	CADCAM INTERACTION

ARMY CADCAM PROJECTS
83/10/04.

PROJ NUMBER	TITLE	PROJ COST
* 6 84 8403	DESIGN CRITERIA FOR HARDENING (CAD/CAM)	261

PROBLEM	SOLUTION	TECHNOLOGY AREA
* SELECTION OF THE BEST HARDENING PROCESS. INCOMPLETE HARDENING THROUGHOUT THE COMPONENT AND COMPLICATIONS CAUSED DURING THE HEAT TREATMENT OF WELDMENTS ARE RECURRING PROBLEMS CURRENTLY ADDRESSED BY EMPIRICAL METHODS.	THE RELATIONSHIPS OF DIFFERENT VARIABLES SUCH AS QUENCH RATES, COMPONENT SIZE, SHAPE, AND COMPOSITION WILL BE ESTABLISHED. A COMPUTER WILL BE PROGRAMMED TO FURNISH THE NECESSARY INFORMATION	CADCAM INTERACTION

PROJ NUMBER	TITLE	PROJ COST
* 6 84 0002	MMT CAM APPLICATION OF ROBOTICS TO SHELTER REFINISHING	400

PROBLEM	SOLUTION	TECHNOLOGY AREA
* SPRAY PAINTING AND SANDING OF ALUM SKINNED MILITARY CONTAINERS IS LABOR INTENSIVE AND CREATES A HARSH WORKING ENVIRONMENT. DEVICES TO SENSE PRESENCE AND ABSENCE OF PAINT + TO CONTROL HEAT BUILD-UP TO PREVENT ALUM SKIN DELAMINATION ARE NEEDED.	DEVELOP A ROBOT EQUIPMENT SPECIFICATON AND DESIGN WITH NECESSARY FEEDBACK MECHANISMS.	FABRICATION CADCAM

PROJ NUMBER	TITLE	PROJ COST
* 1 84 7443	ROBOTICS FOR HIGH PRODUCTIVITY FORGINGS	225

PROBLEM	SOLUTION	TECHNOLOGY AREA
* THE NEED FOR INCREASED PRODUCTIVITY COUPLED WITH DECREASED FUNDING DICTATES THAT CURRENT TECHNOLOGY, SUCH AS ROBOTICS, MUST BE UTILIZED FULLY ' EFFECTIVELY IN THE MANUFACTURING PROCESS. AS FORGING CAPCITY DECREASES PRODUCERS NEED TO IMPROVE MET*	AN ADVANCED SYSTEM WOULD INCLUDE A ROBOT AND IMAGE SENSING AND THERMAL VIDEO SUBSYSTEM FOR GATHERING AND PROVIDING INFORMATION TO A MINICOMPUTER. THIS DATA WOULD BE USED TO CONTROL FORM AND HEATING OF THE WORKPIECE.	FABRICATION CADCAM

ARMY CADCAM PROJECTS
83/10/04.

PROJ NUMBER	SUBTASK	TITLE	PROJ COST
* 4 84 6059	12	AUTOMATED INTERIOR SPRAY PAINTING	350

PROBLEM	SOLUTION	TECHNOLOGY AREA
* MATERIALS AND MANUFACTURING PROCESSES EMPLOYED IN THE MFG OF THE FVS CAN BE IMPROVED BY INCORPORATING NEW TECHNOLOGIES TO THE CURRENT SYSTEM. THIS WILL ENABLE THE FVS TO BE MANUFACTURED MORE ECONOMICALLY.	IMPROVE PROCESSES FOR FVS MFG. THESE INCLUDE CAST ALUM COMPONENTS, LASER HEAT TREAT, SELF THREADING FASTNERS, ADHESIVE BONDING, PLASMA ARC WELDING, ETC.	FABRICATION CADCAM

PROJ NUMBER	TITLE	PROJ COST
* 6 84 8416	FLEXIBLE MACHINING SYSTEM - RIA MCAM)	399

PROBLEM	SOLUTION	TECHNOLOGY AREA
* FLEXIBLE MACHINING SYSTEM (FMS) TECHNOLOGY OFFERS MANY ADVANTAGES TO PLANTS THAT MANUFACTURE PARTS OR LOW TO MID VOLUME QUANTITIES. HOWEVER, ESTABLISHING FEASIBILITY, PURCHASING, AND IMPLEMENTING FMS IS WIDE IN SCOPE AND VERY COMPLEX.	FEASIBILITY WILL BE ESTABLISHED VIA AN FY82 PROJECT. THIS PROJECT WILL PERFORM THE ANALYSES NEEDED TO DEVELOP A REQUEST FOR PROPOSAL (RFP). A RFP WILL BE PREPARED.	FABRICATION CADCAM

PROJ NUMBER	TITLE	PROJ COST
* 6 84 8424	AUTOMATIC/ROBOTIC WELDING OF WEAPONS COMPONENTS	291

PROBLEM	SOLUTION	TECHNOLOGY AREA
* THE REPAIR OF DEFECTIVE WELDS ARE FREQUENTLY EXPERIENCED. REPAIR REQUIREMENTS ARE OFTEN TRACED TO THE SKILL LEVEL OF THE WELDING OPERATORS.	ADAPTIVE CONTROLS ARE BEING USED IN AN INCREASING NUMBER OF WELDING APPLICATIONS TO DEEMPHASIZE OPERATOR SKILL IN MAKING CONSISTENT PRODUCT. SUCH FEED BACK CONTROL ROBOTS SHOULD BE USED ALSO IN WEAPONS FABRICATION.	FABRICATION CADCAM

ARMY CADCAM PROJECTS
83/10/04.

PROJ NUMBER	TITLE	PROJ COST
* H 84 5174	AUTO SPUT PROC CONT F/PROD ZINC OXIDE ACOUSTIC DEVICES - CAM	422

PROBLEM	SOLUTION	TECHNOLOGY AREA
* GAS MIXTURE, ZNO PURITY + SPUTTERING PARAMETERS ARE MANUALLY MONITORED USING A MASS ANALYZER. CORRECTIONS IN FLOW + DEPOSITION PROCESSES ARE SLOW AND PERFORMED AFTER OCCURRENCE.	LATEST STATE-OF-THE-ART MASS ANALYSIS EQUIPMENT WILL BE COMPUTER/ MICROPROCESSOR COUPLED TO THE PROCESSING EQUIPMENT USED FOR FABRICATING ZNO DELAY LINES. VACUUM DEPOSITION AND GAS FLOW RATES WLL BE OPTIMIZED.	MANUFACTURING CONTROL

PROJ NUMBER	TITLE	PROJ COST
* 6 84 8154	COMPUTER INTEGRATED MANUFACTURING (CIM) FOR CANNONS	450

PROBLEM	SOLUTION	TECHNOLOGY AREA
* NUMERICAL CONTROL MACHINE TOLLS OFFER MANY ADVANTAGES OVER CONVENTIONAL MACHINE TOOES BUT HAVE CERTAIN DISADVANTAGES. ONE PROBLEM AREA IS GETTING MACHINE INSTRUCTIONS TO THE MACHINE TOOL AND COLLECTING MANAGEMENT INFORMATION.	INTERFACE IN-HOUSE COMPUTER FACILITIES WITH CURRENT AND FUTURE NC MACHINE TOOLS TO FORM AN ADVANCED COMPUTER INTEGRATED MFG SYSTEM. UTILIZE DNC TECHNOLOGY.	MANUFACTURING CONTROL

PROJ NUMBER	TITLE	PROJ COST
* 6 84 8241	COMPUTER DIAGNOSTICS + CONTROL APPL TO BORE GUIDANCE (CAM)	85

PROBLEM	SOLUTION	TECHNOLOGY AREA
* THE BORE GUIDANCE SYSTEM CONSISTS OF MANY INTERDEPENDENT ELEMENTS MAKING IT DIFFICULT AND TIME CONSUMING TO DIAGNOSE PROBLEMS. ALSO, TUBES WITH LARGE WALL VARIATIONS GREATLY INCREASE THE DIFFICULTY IN MAINTAINING CONTROL.	COMPUTER CONTROL WILL MAKE POSSIBLE SUCH FEATURES AS SELF TESTING, CHECKING, MONITORING, AND CALIBERATIN IN CONTROL, TEST, AND MEASUREMENT SYSTEMS.	MANUFACTURING CONTROL

ARMY CADCAM PROJECTS
83/10/04.

PROJ NUMBER	TITLE	PROJ COST
* 6 84 8417	FACTORY INFORMATION MANAGEMENT - RIA (CAM)	280

PROBLEM	SOLUTION	TECHNOLOGY AREA
* THE EXCHANGE OF INFORMATION WITHIN THE ROCK ISLAND ARSENAL MANUFACTURING ORGANIZATION IS BY HARDCOPY REPORTS. THE GENERATION OF MANUFACTURING MANAGEMENT REPORTS IS LABOR INTENSIVE AND ERROR PRONE.	THE REQUIREMENTS FOR RIA MANUFACTURING MANAGEMENT OF PRODUCTION DATA WILL BE DEFINED AND A PILOT COMPUTER SYSTEM WILL BE PROCURED.	MANUFACTURING CONTROL

PROJ NUMBER	TITLE	PROJ COST
* 6 84 8433	IN PROCESS CONTROL OF SELAS HEAT TREAT SYSTEM (CAM)	125

PROBLEM	SOLUTION	TECHNOLOGY AREA
* AS GUN TUBES ARE HEAT TREATED THE ACTUAL WORKPIECE TEMPERATURE IS NOT KNOWN UNTIL THE PIECE EXITS THE FURNACE. EXCESSIVE FORGING TEMPERATURES CAN DEGRADE MECHANICAL PROPERTIES.	AUTOMATICALLY CONTROL FURNACE TEMPERATURES BY MONITORING THE ACTUAL WORKPIECE TEMPERATURE, AND FEEDING THIS DATA TO MICROPROCESSORS.	MANUFACTURING CONTROL

PROJ NUMBER	SUBTASK	TITLE	PROJ COST
* 4 84 6057	15	APPLICATION OF GROUP TECHNOLOGY TO M1 MFG PLANNING	350

PROBLEM	SOLUTION	TECHNOLOGY AREA
* MATERIALS AND MANUFACTURING PROCESSES EMPLOYED IN THE MFG OF THE M1 CAN BE IMPROVED BY INCORPORATING NEW TECHNOLOGIES TO THE CURRENT SYSTEM. THIS WILL ENABLE THE M1 TO BE PRODUCED MORE ECONOMICALLY.	IMPROVE PROCESSES FOR M1 MFG. THESE INCLUDE THERMAL CUTTING, AUTOMATED METALLIZING, THERMALLY ASSISTED MACHINING, ETC.	PLANNING/GROUP TECH

ARMY CADCAM PROJECTS
83/10/04.

PROJ NUMBER	TITLE	PROJ COST
* 6 84 8306	ON-LINE PRODUCTION INFORMATION SYSTEM - RIA (CAM)	571

PROBLEM	SOLUTION	TECHNOLOGY AREA
* THE MANUFACTURING DATA BASE CANNOT BE ACCESSED THROUGH AN ON-LINE DATA BASE SYSTEM, MAKING INTEGRATION OF AUTOMATED SYSTEMS FOR PROCESS PLANNING, TIME STDS GENERATION, FACILITIES/MOBILIZATION PLANNING AND PRODUCTION CONTROL SIMULATION DIFFICULT.	DEVELOP THE MANUFACTURING DATA BASE FROM ITS PRESENT BATCH ORIENTATED ENVIRONMENT TO AN ON-LINE SYSTEM.	PLANNING/GROUP TECH

PROJ NUMBER	TITLE	PROJ COST
* 2 84 9289	AUTOTEST OF MICROWAVE DEVICE WAFERS (CAM)	390

PROBLEM	SOLUTION	TECHNOLOGY AREA
* THE NEED TO WAIT UNTIL PACKAGING IS COMPLETE BEFORE TESTING MICROWAVE DEVICES (DIODES, TRANSISTORS) RUNS UP THE COST BECAUSE PACKAGING COST IS APPRECIABLE. BUT TESTING OF DEVVICE CHIPS CANNOT NOW BE DONE.	DEVELOP AN AUTOMATED MEASURING SYSTEM FOR EVALUATION THE SEMICON MTL. AT THE WAFER LEVEL, CHECKING EACH DIE AUTOMATICALLY. PERFROM BOTH DC AND RF PROBE MARK UNDER-SPEC DIES. PROVIDE DIAGONISTIC DATA TO PERMIT CHANGING THE PROCESS TO IMPROVE YIELD.	TEST, INSP, EVAL

FISCAL YEAR
85

CAM RELATED

MM&T

PROJECTS

ARMY CADCAM PROJECTS
83/10/04.

PROJ NUMBER	TITLE	PROJ COST
* 2 85 3094	COMMUNICATIONS TECHNOLOGY TECHMOD FOR JTIDS	1000

PROBLEM	SOLUTION	TECHNOLOGY AREA
* COMMUNICATIONS EQUIPMENT IS MANUFACTURED USING LABOR INTENSIVE, LOW VOLUME PROCESSES. MACHINES ARE OLD AND UNAUTOMATED. NEW METHODS, PROCESSES AND EQUIPMENT ARE NEEDED.	USE FLEXIBLE MANUFACTURING TECHNIQUES, COMPUTER AIDED MANUFACTURING, GROUP TECHNOLOGY, COMPUTER CONTROLLED EQUIPMENT, ROBOTS, AND MOTORIZED CONVEYORS. USE AUTOMATIC INSERTION, VAPOR PHASE AND WAVE SOLDERING, AND NUMERICALLY CONTROLLED MACHINING.	ARCHITECTURE

PROJ NUMBER	TITLE	PROJ COST
* 3 85 1075	ELECTRONICS COMPUTER AIDED MFG	3300

PROBLEM	SOLUTION	TECHNOLOGY AREA
* ALTHOUGH INTEGRATED CIRCUITS, HYBRID CIRCUITS, PRINTED CIRCUITS AND CABLES ARE DESIGNED ON A COMPUTER, THERE IS LITTLE COMPUTERIZED CONTROL OF PROCESSES USED TO PRODUCE THESE ITEMS. A MASTER PLAN IS NEEDED TO DEFINE THE AREA AND REQUIREMENTS.	DEVELOP A DOD MASTER PLAN FOR COMPUTER-AIDED DESIGN AND MFG OF ELECTRONIC SYSTEMS. USE AIR FORCE?S ICAM AND NASA?S IPAD PROGRAMS TO DEFINE CAD/CAM AND ELECTRONIC TECHNOLOGIES TO MAKE INTEGRATED CIRCUITS, HYBRID CIRCUITS, PRINTED CIRCUITS, AND CABLES.	ARCHITECTURE

PROJ NUMBER	TITLE	PROJ COST
* 6 85 8305	INTEGRATED MANUFACTURING SYSTEM - IMS	950

PROBLEM	SOLUTION	TECHNOLOGY AREA
* MI SYSTEMS ARE APPLIED LOCALLY BUT THERE IS NO DATA MANAGEMENT SYSTEM FOR THE ENTIRE MFG ACTIVITY. THIS INCREASES COST DUE TO LONG LEAD TIMES, SCHEDULE INTERRUPTIONS AND SHORTAGES OF MACHINE AVAILABILITY, LABOR AND MATERIAL.	DEVELOP AN MIS WHICH ADDRESSES ACTIVITIES OF ALL DIRECTORATES SUPPORTIVE TO MANUFACTURING AT RIA. THE SYSTEM WILL USE STATE-OF-THE-ART TECHNOLOGY TO ELIMINATE OPTIMUM SCHEDULING AND PIN POINT POTENTIAL PROBLEM AREAS FOR EASIER RESOLUTION.	ARCHITECTURE

ARMY CADCAM PROJECTS
83/10/04.

PROJ NUMBER	TITLE	PROJ COST
* 6 85 8559	CIM FOR CANNON CAD/CAM/COMM	1160

PROBLEM	SOLUTION	TECHNOLOGY AREA
* THE EXCHANGE OF MANUFACTURING DATA AT WATERVLIET ARSENAL IS LARGELY MANUAL, ERROR PRONE AND TIME CONSUMING. CURRENT PROCESS PLANNING, SCHEDULING, AND PRODUCTION CONTROL SYSTEMS EXCHANGE DATA MANUALLY.	DETERMINE THE SYSTEM REQUIREMENTS FOR A COMPUTER AIDED DESIGN SYSTEM. DETERMINE THE SYSTEM REQUIREMENTS TO INTEGRATE THE COMPUTER AIDED MANUFACTURING FACILITIES AND BUSINESS SYSTEMS. THE SYSTEM REQUIREMENTS WILL BE ADDRESSING EXISTING AND NEAR TERM.	ARCHITECTURE

PROJ NUMBER	TITLE	PROJ COST
* 6 85 8402	WARM FORGING FOR WEAPON COMPONENTS	227

PROBLEM	SOLUTION	TECHNOLOGY AREA
* EXCESSIVE ENERGY IS CONSUMED IN CONVENTIONAL FORGING. ALSO DIE LIFE IS SHORTENED BY HIGH FORGING TEMPERATURES AND BY OXIDATION.	BY USING CAD/CAM TECHNIQUES FOR DIE DESIGN, FORGING WILL BE DONE AT MUCH LOWER TEMPERATURE AND THE FINAL PARTS WILL HAVE BETTER MECHANICAL PROPERTIES	CADCAM INTERACTION

PROJ NUMBER	TITLE	PROJ COST
* 6 85 8403	DESIGN CRITERIA FOR HARDENING (CAD/CAM)	276

PROBLEM	SOLUTION	TECHNOLOGY AREA
* SELECTION OF THE BEST HARDENING PROCESS. INCOMPLETE HARDENING THROUGHOUT THE COMPONENT AND COMPLICATIONS CAUSED DURING THE HEAT TREATMENT OF WELDMENTS ARE RECURRING PROBLEMS CURRENTLY ADDRESSED BY EMPIRICAL METHODS.	THE RELATIONSHIPS OF DIFFERENT VARIABLES SUCH AS QUENCH RATES, COMPONENT SIZE, SHAPE, AND COMPOSITION WILL BE ESTABLISHED. A COMPUTER WILL BE PROGRAMMED TO FURNISH THE NECESSARY INFORMATION	CADCAM INTERACTION

ARMY CADCAM PROJECTS
83/10/04.

PROJ NUMBER	TITLE	PROJ COST
* 1 85 7443	ROBOTICS FOR HIGH PRODUCTIVITY FORGINGS	435

PROBLEM	SOLUTION	TECHNOLOGY AREA
* THE NEED FOR INCREASED PRODUCTIVITY COUPLED WITH DECREASED FUNDING DICTATES THAT CURRENT TECHNOLOGY, SUCH AS ROBOTICS, MUST BE UTILIZED FULLY ' EFFECTIVELY IN THE MANUFACTURING PROCESS. AS FORGING CAPCITY DECREASES PRODUCERS NEED TO IMPROVE MET*	AN ADVANCED SYSTEM WOULD INCLUDE A ROBOT AND IMAGE SENSING AND THERMAL VIDEO SUBSYSTEM FOR GATHERING AND PROVIDING INFORMATION TO A MINICOMPUTER. THIS DATA WOULD BE USED TO CONTROL FORM AND HEATING OF THE WORKPIECE.	FABRICATION CADCAM

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PROJ NUMBER	TITLE	PROJ COST
* 5 85 4624	AUTOMATED MFG OF MILLIMETER WAVE DIODES (CAM)	2753

PROBLEM	SOLUTION	TECHNOLOGY AREA
* CURRENT MANUFACTURE OF GUNN, VARACTOR + MIXER DIODES IS SLOW HAND LABOR OF HIGH PAID SCIENTISTS. THESE GaAS DEVICES OPERATE AT 35 GHZ. THE FABRICATION YIELD IS VERY LOW.	TWO VENDORS WILL BE FUNDED TO AUTOMATE USING MOLECULAR BEAM EPITAXY.	FABRICATION CADCAM

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PROJ NUMBER	TITLE	PROJ COST
* 5 85 4628	AUTO MFG IR DETECTORS + REFLECTORS	2262

PROBLEM	SOLUTION	TECHNOLOGY AREA
* CURRENT TEST AND ASSEMBLY PROCESSES ARE NOT CAPABLE OF THE REQUIRED HIGH PRODUCTION RATE AND LARGE PRODUCTION VOLUME.	COMPUTER CONTROLLED AUTOMATION OF THE TEST AND ASSEMBLY OF THE IR DETECTOR/REFLECTOR MODULES AND REFLECTOR SURFACE MACHINING ARE PROPOSED.	FABRICATION CADCAM

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ARMY CADCAM PROJECTS
83/10/04.

PROJ NUMBER	TITLE	PROJ COST
* 5 85 4630	AUTOMATED METHOD FOR BORE SIGHTING IR (CAM)	1581

PROBLEM	SOLUTION	TECHNOLOGY AREA
* BORESIGHTING THE TRIAD OF MMW SENSOR, IR SENSOR AND WARHEAD TO LESS THAN 1 MRAD IS LABOR INTENSIVE .	IMPLEMENTATION OF AN AUTOMATED TEST STATION TO CHECK BORESIGHT/SENSOR ALIGNMENT AND TO MAKE FINAL ADJUSTMENTS AUTOMATICALLY.	FABRICATION CADCAM

PROJ NUMBER	TITLE	PROJ COST
* 6 85 8416	FLEXIBLE MFG SYSTEM W/SPECIAL TOOLING - RIA	176

PROBLEM	SOLUTION	TECHNOLOGY AREA
* FLEXIBLE MACHINING SYSTEM (FMS) TECHNOLOGY OFFERS MANY ADVANTAGES TO PLANTS THAT MANUFACTURE PARTS ON LOW TO MID VOLUME QUANTITIES. HOWEVER, ESTABLISHING FEASIBILITY, PURCHASING, AND IMPLEMENTING FMS IS WIDE IN SCOPE AND VERY COMPLEX.	FEASIBILITY WILL BE ESTABLISHED VIA AN FY82 PROJECT. THIS PROJECT WILL PERFORM THE ANALYSES NEEDED TO DEVELOP A REQUEST FOR PROPOSAL (RFP). A RFP WILL BE PREPARED.	FABRICATION CADCAM

PROJ NUMBER	TITLE	PROJ COST
* 6 85 8603	ROBOTIC WELDING - RIA	285

PROBLEM	SOLUTION	TECHNOLOGY AREA
* PRODUCTIVITY IN THE WELD SHOP IS LIMITED BECAUSE THE MAJORITY OF THE WELDING IS DONE MANUALLY.	MULTIPLE AXIS ROBOTIC WELDERS INTEGRATED WITH MULTIPLE AXIS PART HANDLING SYSTEMS, PALLETIZING, PREHEAT FURNACES, STRESS RELIEVING OVENS, AND FIXTURING CAN REDUCE COSTS WHILE IMPROVING RATES.	FABRICATION CADCAM

ARMY CADCAM PROJECTS
83/10/04.

PROJ NUMBER	TITLE	PROJ COST
* 1 85 7471	PROCESS CONTROL SYSTEM FOR N/C AND CNC MACHINES	300

PROBLEM	SOLUTION	TECHNOLOGY AREA
* PRESENT PROCESS CONTROL SYSTEMS FOR NC AND CNC MACHINES DO NOT INCLUDE REAL-TIME MONITORING AND FEEDBACK COMPENSATION.	DEVELOP A STATISTICAL PROCESS CONTROL SYSTEM CAPABLE OF PERFORMING REAL TIME PROCESS CONTROL ANALYSIS DURING THE MACHINING OPERATION, USING IN-PROCESS GAGING AND AN ADVANCED ELECTRONIC ADAPTIVE CONTROL SYS TO PERFORM QUAL CHECKS DURING MACHINE CYCLE.	MANUFACTURING CONTROL

PROJ NUMBER	TITLE	PROJ COST
* 6 85 8126	ADAPTIVE CONTROL TECHNOLOGY (CAM)	200

PROBLEM	SOLUTION	TECHNOLOGY AREA
* CURRENT GRINDING PROCESSES DO NOT TAKE ADVANTAGE OF THE GRINDING WHEEL CUTTING EFFICIENCY. PRECISION TOLERANCES ARE DIFFICULT TO HOLD DUE TO PART HEATING. WHEEL WEAR RATES INCREASE EXPONENTIALLY WITH FEED RATES AND LIMIT PRODUCTIVITY.	USE A PROCESS CALLED ENERGY ADAPTIVE GRINDING. IT USES AN ADAPTIVE CONTROL, FITTED TO A CYLINDRICAL GRINDER. WHEEL SPEED, WHICH DETERMINES WHEEL SHARPNESS WHICH EFFECTS METAL REMOVAL RATES AND EFFICIENCY, IS CONTROLLED.	MANUFACTURING CONTROL

PROJ NUMBER	TITLE	PROJ COST
* 5 85 0927	COMPUTER AIDED PROCESS PLANNING FOR CB FILTERS (CAM)	200

PROBLEM	SOLUTION	TECHNOLOGY AREA
* ALTHOUGH AN EXTENSIVE AMOUNT OF INFORMATION ON CHEMICAL AND BIOLOGICAL GAS FILTERS (FILTER PERFORMANCE DATA, PROCESS DESIGN INTEGRITY, PRODUCIBILITY, ETC.) EXISTS, A STRUCTURED DATA BASE IS NOT AVAILABLE.	DEVELOP A COMPUTER AIDED PROCESS PLANNING SYSTEM FOR CB FILTERS. THIS SYSTEM WILL THEN BE MADE AVAILABLE TO INDUSTRY THROUGH APPLICABLE PROCUREMENTS.	PLANNING/GROUP TECH

ARMY CADCAM PROJECTS
83/10/04.

PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* 5 85 4627	AUTO TESTING OF MILLIMETER WAVE TRANSDUCER	2043	TEST, INSP, EVAL

PROBLEM

* THE HAND LABOR INVOLVED IN TUNING MILLIMETER WAVE TRANSDUCERS IS EXTREMELY COSTLY.

SOLUTION

THE USE OF LASER TRIMMING EQUIPMENT TO MAKE CUTS IN MICROSTRIP LINES WHILE PERFORMANCE IS SIMULTANEOUSLY MONITORED WILL SIGNIFICANTLY REDUCE COST.

PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* 5 85 4629	AUTO ASSEMBLY + TEST OF IR TRANSDUCER	1946	TEST, INSP, EVAL

PROBLEM

* ASSEMBLY AND TEST OF THE IR TRANSDUCER ARE LABOR INTENSIVE OPERATIONS. MANY IN-PROCESS ALIGNMENT AND TEST OPERATIONS ARE DONE MANUALLY BY HIGHLY TRAINED PERSONNEL IN A CLEAN ROOM ENVIRONMENT. THESE MANUFACTURING TECHNIQUES ARE ERROR PRONE.

SOLUTION

THE REQUIREMENTS WILL BE DETERMINED FOR AN AUTOMATED COMPUTER CONTROLLED ALIGNMENT AND TESTING EQUIPMENT. PROCEDURES WILL BE ESTABLISHED FOR PROCESSING IR TRANSDUCERS WITH THIS AUTOMATED EQUIPMENT.

PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* 5 85 4633	AUTO SENSOR SYSTEMS TEST F/MMW + IR SNESOR	724	TEST, INSP, EVAL

PROBLEM

* AT PRESENT THE MILLIMETER/IR SENSOR SYSTEM IS MANUALLY SYNCHRONIZE. THIS METHOD IS SLOW AND NOT CAPABLE OF MEETING COST REQUIREMENTS, THROUGHPUT, AND SCHEDULE GOALS.

SOLUTION

TO USE COMPUTER CONTROLLED VERSION OF SENSOR SIMULATORS WHICH ARE COMMERICALLY.

PROJ NUMBER	TITLE	PROJ COST
* 5 85 4659	AUTOMATIC INSPECTION FOR ROTATING BAND CHEMISTRY	432

PROBLEM	SOLUTION	TECHNOLOGY AREA
* ROTATING BAND OF THE M483A1 IS PRESENTLY ANALYZED FOR IRON AND FINE CONTENT BY COLLECTING CHIPS FROM FINAL MACHINING PROCESS. AT PRESENT THE TURN AROUND IS FOR THIS ANALYSIS IS EXCESSIVE CREATING LARGE BACKLOG OF PROJECTILES AWAITING RELEASE.	THE PRESENT METHOD OF ANALYSIS WILL REPLACE BY AN X-RAY FLUORESCENCE TECHNIQUE MEASURING THE IRON-ZINC CONTENT DIRECTLY ON THE BAND WITHIN A THIRTY MINUTE PERIOD.	TEST, INSP, EVAL

PROJ NUMBER	TITLE	PROJ COST
* 6 85 8370	AUTO INSP + PROCESS CONTROL OF WPNS PARTS MFG (CAM)	225

PROBLEM	SOLUTION	TECHNOLOGY AREA
* FOR BARREL MFG, CURRENT HAND GAGED INSPECTION IS A MAJOR TIME FACTOR. BARREL STRAIGHTENING IS ALSO DONE MANUALLY AS MANY AS 13 TIMES DURING THE MFG CYCLE. NEW DNC EQUIP BEING PROCURED VIA PIF 66X7986 REQUIRES CENTRAL CONTROL.	AUTOMATE, TO MAX FEASIBLE DEGREE, INSPECTION OPERATIONS. USING LASER TECHNOLOGY, EQUIP A STRAIGHTENING PRESS WITH FEEDBACK CONTROL TO SELECT LOCATION FOR APPLICATION OF BENDING FORCES. CONTROL ALL DNC EQUIPMENT WITH A CNC MASTER UNIT.	TEST, INSP, EVAL

PROJ NUMBER	TITLE	PROJ COST
* 6 85 8510	AUTOMATED INSPECTION OF RECOIL COMPONENTS	140

PROBLEM	SOLUTION	TECHNOLOGY AREA
* MANY COMPONENTS ARE UNSALVAGEABLE BECAUSE CYLINDRICITY IS LOST AFTER A MANUFACTURING PROCESS OR UNACCEPTABLE SURFACE INTEGRITY. THESE COMPONENTS ARE USUALLY UNDETECTED UNTIL NEEDLESS STEPS IN THE PROCESS ROUTINGS HAVE BEEN PERFORMED.	A COMPUTERIZED MEASURING AND RECORDING SYSTEM WILL BE ASSEMBLED AND APPLIED TO THE DETERMINATION OF CYLINDRICITY OF HOLES AND ROUND STOCK PRIOR TO AND THROUGHOUT FABRICATION.	TEST, INSP, EVAL

APPENDICES

APPENDIX A - INDUSTRIAL PRODUCTIVITY IMPROVEMENT PROGRAMS

APPENDIX B - ROBOTICS

APPENDIX C - INDEX OF PROJECTS BY THRUST AREA

APPENDIX D - USER'S GUIDE

APPENDIX E - DISTRIBUTION LIST

INDUSTRIAL PRODUCTIVITY IMPROVEMENT PROGRAMS

The efforts listed below are programs categorized as industrial productivity improvement programs; these efforts were omitted from the summaries and analysis because they encompass several technical areas.

PROJECT NUMBER	PROJECT TITLE	PROJECT CYCLE	(FY)	PROJECT COST 83	84	85
H 5196	Industrial Productivity Improvement (Electronics)	Approved Apportionment		893	1096	
1 7427	Attack Helicopter Productivity Improvement (API) Program	Approved Budget		1500		3500
1 7428	IPI Program - AVCO Lycoming - Turbine Engines	Apportionment			1000	
1 7433	IPI Program - BELL Helicopter Textron Inc - AHIP	Approved		1200		
2 3094	Communications Technology TechMod for JTIDS	Approved Apportionment Budget		1054	1222	1000
3 1075	Electronics Computer Aided Manufacturing (ECAM)	Apportionment Budget			1100	3300
4 4006	Bradley FVS IPI Program	Budget				2400
4 6089	Abrams Tank Productivity Improvement (Phase I)	Budget				3200
4 6090	Tooele Army Depot Productivity Improvement Program	Apportionment Budget			1000	2500
4 6095	Abrams Transmission Productivity Improvements	Approved		176		
5 1501	Producibility - Integrated Computer Systems (PICS) (ARRCOM)	Apportionment			150	
6 8305	Integrated Manufacturing System (ICAM)	Approved Apportionment Budget		75	2094	950
6 8329	Fire Control Optical Devices New Process Production Tech	Apportionment			460	
6 8559	CIM for Cannon CAD/CAM/COMM	Budget				1160

ROBOTICS

The efforts listed below are programs with emphasis placed on robotics as a solution to a technical problem. These projects were not separately categorized because they cross several thrust areas; however, in subsequent issues these projects will be separated.

PROJECT NUMBER	PROJECT TITLE	PROJECT CYCLE	(FY)	PROJECT COST 83	84	85
G 0002	CAM Application of Robotics to Shelter Refinishing	Approved Apportionment		50	400	
1 7443	Robotics for High Productivity Forgings	Apportionment Budget			225	430
3 1109	Robotized Wire Harness Assembly System	Apportionment			1000	
4 6059	FVS Combat Vehicle-Mfg Technology	Apportionment			901	
5 4062	Auto Mfg Support for Mortar Increment Containers	Approved		250		
5 4629	Auto Assembly + Test of IR Transducer	Budget				1946
5 4634	Auto Assembly of Elec Module + Top Sensor	Budget				1018
6 8424	Automatic/Robotic Welding of Weapon Components (CAM)	Apportionment			291	
6 8603	Robotic Welding	Budget				285

INDEX OF PROJECTS BY THRUST AREA

PROJECT NUMBER	THRUST	PAGE NO. (FY) 83	84	85
	MANUFACTURING CONTROL			
H 5174		25	38	
1 7471				49
4 6057-15		25	39	
6 8120		25		49
6 8154		26	38	
6 8241			38	
6 8243		26		
6 8417			39	
6 8433			39	
	ASSEMBLY			
3 1109			34	
	SIM, MODEL, OP RESCH			
G 3001		27		
	TEST, INSP, EVAL			
G 7001		28		
2 9289			40	
5 4627				50
5 4629				50
5 4633				50
5 4659				51
6 8370				51
6 8510				51

USER'S GUIDE

The CAM Related Projects document contains a listing of CAM related MMT efforts. The information is presented by CAM technology thrust areas corresponding to the thrust area which was identified in the P-16 initially submitted for funds. Data presented for each effort includes the Project Number, Title, Cost, Thrust Area, Problem, and Solution. The example below explains the format of the computer print-outs included in this document.

PROJECT NO. (1)	SUBTASK (1a)	TITLE (2)	PROJ COST (3)
T 81 5014	9	Improved Foundry Castings Utilizing CAM	50

PROBLEM (4)	SOLUTION (5)	TECH AREA (6)
Foundry Casting Processes are Wasteful of Raw Materials	Optimize Casting Processes by Digital Computer Analysis of Advanced Fluid Flow and Thermal Activity.	CAD/CAM Interaction

THIS FORM IS USED FOR SUMMARIZING THE MMT PROGRAM PROJECTS' STATUS. USER'S GUIDE BELOW EXPLAINS THE SIGNIFICANCE OF EACH ELEMENT HEREIN.

EXPLANATION OF DATA PRESENTATION

1. Project Number
   - Command Code - Refer to list of command codes, page D-2
   - Fiscal Year
   - Effort Number

1a Subtask Number - if applicable

2. Title
3. Project Cost - Total cost in thousands of dollars
4. Problem - Description of the problem the MMT effort addresses
5. Solution - Description of how the MMT effort proposes to solve the problem
6. Technical Area - Thrust Area

COMMAND CODES LIST

Command	Acronym	Command Identifier
Test & Evaluation Command	TECOM	O
Aviation Systems Command	AVSCOM	1
Communications & Electronics Command	CECOM	2
Missile Command	MICOM	3
Armament, Munitions and Chemical Command (Munitions)	AMCCOM (Ammo)	5
Armament, Munitions and Chemical Command (Munitions)	AMCCOM (Wpns)	6
Troop Support Command	TROSCOM	7
Materiel Development & Readiness Command	DARCOM	D
Belvoir R&D Center	BRDC	E*
Depot Systems Command	DESCOM	G
Electronics R&D Command	ERADCOM	H
Army Materials and Mechanics Research Center	AMMRC	M
Natick R&D Center	NRDC	Q*
Tank-Automotive Command	TACOM	T

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